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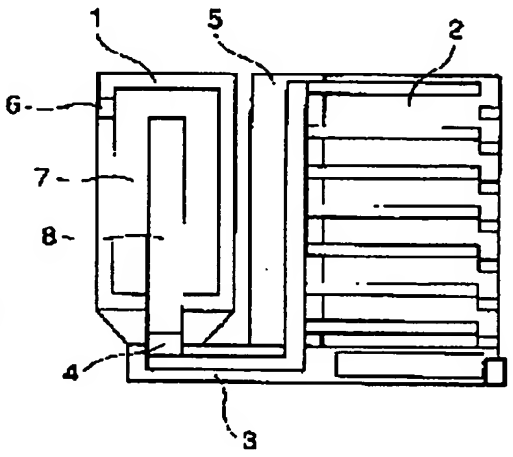
(71)Applicant : TOSHIBA CORP
(72)Inventor : YONEZU MAKI
TAKASHITA MASAHIRO
SUMINO HIROYASU

(54) LIQUID FUEL VESSEL FOR FUEL CELL AND LIQUID FUEL CELL

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a highly reliable fuel cell that simplifies a liquid fuel supply system, to stably supply.
SOLUTION: A fuel cell comprises a fuel cell (2) having a unit cell with an electric generator consisting of a fuel electrode, an oxidizing electrode, and an electrolytic plate arranged between them, and a liquid fuel vessel (1) connected to the fuel cell for containing liquid fuel supplied thereto. The fuel cell causes the liquid fuel to be supplied to the unit cell by capillary attraction, vaporized therein, and supplied to the fuel electrode, while the liquid fuel vessel has a pressure adjustment (6) for supplying the adequate amount of the liquid fuel extracted from the fuel extractor.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the liquid fuel hold container used for the liquid fuel cell and this which started the fuel cell, especially were suitable for the miniaturization.
[0002]
[Description of the Prior Art] As a liquid fuel cell, various types, such as a thing using a fuel evaporation supply mold or capillary force, are known.
[0003] Since a high-concentration fuel can be directly used for the fuel cell of the conventional fuel evaporation supply mold, it is advantageous about miniaturization of the fuel section. However, since the system is complicated, with the configuration as it is, the miniaturization has the problem of being difficult. On the other hand, although it is suitable for a miniaturization constitutionally, since a fuel is supplied to a fuel electrode in the state of a direct liquid, a low-concentration fuel must be used for the conventional liquid fuel cell using capillary force. Therefore, the volume of the fuel section becomes large as a result, and a miniaturization is difficult.
[0004] Moreover, in order to be stabilized and to take out the output of a fuel cell, it is required that it should be stabilized and a fuel should be supplied. If the liquid-storage section side which has held liquid fuel compared with a body side will be in a negative pressure condition when supplying the fuel of a liquid especially, it becomes impossible to take out liquid fuel further, and the generation-of-electrical-energy output by the side of a body will decline. On the other hand, when the pressure by the side of the liquid-storage section becomes remarkably high, the liquid fuel beyond the need will be supplied to a body side, and will deteriorate [that the interior of a body is filled with superfluous liquid fuel, etc. and] a member remarkably. Or it is [fear of a liquid fuel hold container exploding] and is dangerous if the pressure inside the liquid-storage section rises remarkably. In which small fuel cell indicated until now, the liquid fuel hold container was not equipped with the pressure-regulator style, and the problem that an output could not be taken out stably was not able to be avoided.
[0005] Furthermore, when applying to a portable device, in addition to a miniaturization and stable output reservation which were mentioned above, a degree of freedom is required in the installation direction of the body of a fuel cell. That is, it is called for in any installation directions that it is stabilized and liquid fuel is supplied. This has been a very serious failure when putting a fuel cell in practical use as a small power source.
[0006]
[Problem(s) to be Solved by the Invention] It is stabilized, and it can supply liquid fuel and is to offer a fuel cell with the high dependability by which the output was stabilized while this invention solves a trouble in the conventional fuel cell which was mentioned above, it is performed in order to offer a small fuel cell useful as a power source of a small device, and it simplifies the distribution system of liquid fuel.
[0007]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention is a liquid fuel hold container which holds liquid fuel, and it offers the liquid fuel hold container for fuel cells characterize by the ability to emit said liquid fuel outside from the liquid derivation section in the amount which is always the neither more nor less, keep the pressure in this container constant by the pressure-regulator style.
[0008] Moreover, the body of a fuel cell with which this invention was equipped with the cell which has the electromotive section which comes to pinch an electrolyte plate between a fuel electrode and an oxidizer pole, The liquid fuel for supplying said body of a fuel cell is held, and the liquid fuel hold container connected to said body of a fuel cell is provided. Said body of a fuel cell Said liquid fuel is introduced into said cell by capillary force, and it generates electricity by this liquid fuel's evaporating within said cell, and supplying it to said fuel electrode. Said liquid fuel hold container Said liquid fuel is

drawn from the liquid derivation section in the amount which is always the neither more nor less, and the fuel cell characterized by having a pressure-regulator style for supplying said cell is offered.

[0009] Hereafter, this invention is explained to a detail with reference to a drawing.

[0010] Drawing 1 is the schematic diagram showing the important section configuration of the fuel cell which used the liquid fuel hold container for fuel cells of this invention. In addition, the fuel cell shown by drawing 1 is an example of a fuel cell which used the liquid fuel hold container for fuel cells of this invention, and is this limitation neither about arrangement relation nor the size relation of a member.

[0011] Fundamentally, the fuel cell shown in drawing 1 is constituted by the introductory tubing 3 which introduces liquid fuel to the stack body 2 from the liquid fuel hold container 1, the stack body 2, and the hold container 1. Usually, ****** devices (not shown), such as a fan for supplying oxidant gas, are also established. The stack body 2 to illustrate is the structure where a cell with the electromotive section which has the electrolyte plate ****(ed) by a fuel electrode, an oxidizer pole, and these two poles contains the stack by which two or more laminatings were carried out. A cell can also be used by the monolayer, without carrying out a laminating. An example of the configuration of this cell is expressed to drawing 2 . The evaporation plate a, Anode b, an electrolyte membrane c, Cathode d, the gas channel e, and Separator f are arranged between two liquid osmosis plates g, and the cell is constituted so that it may illustrate.

[0012] The introductory tubing 3 can be formed with the capillary which is extent which capillarity commits. Or the introductory tubing 3 is the purpose which assists installation of liquid fuel, and may be filled with the porosity ingredient which liquid fuel is made to permeate. As such a liquid osmosis ingredient, porosity material, such as sponge, such as polyurethane, polyester, a cellulose, and phenol system resin, etc. can be used, for example.

[0013] In the fuel cell of this invention, the liquid fuel hold container 1 is connected to the introductory tubing 3 by the connection 4 so that it may illustrate, and this connection is wanted to be sealed. It is because there is a possibility that liquid fuel may volatilize when sealing of a connection is inadequate. In addition, as liquid fuel which may be used in the fuel cell of this invention, ether, such as alcohols, such as a methanol, ethanol, and propanol, and diethylether, a hydrazine, etc. are mentioned, and especially a methanol is used as a mixed solution with water. Since various un-arranging arise when the component of this mixed solution volatilizes and the presentation ratio of liquid fuel shifts, as for volatilization of a fuel, preventing as much as possible is desirable. Therefore, as for the connection 4 of a container 1 and the introductory tubing 3, it is desirable to have the sealing force of extent in which volatilization of alcohol can be prevented by ordinary pressure. Specifically, it is desired by using liquid fuel as a liquid for sealing of the maximum vapor tension of the fuel component which evaporated to be possible.

[0014] The liquid fuel introduced into a body 2 from the introductory tubing 3 is led to a kind of liquid fuel maintenance material called a receiver 5, in order to be equally stabilized in each cell inside a stack and to supply it. Furthermore, liquid fuel is supplied to each cell through a liquid fuel osmosis member from this receiver 5, and after liquid fuel evaporates in the evaporation section prepared before the fuel electrode, it is introduced into a fuel electrode.

[0015] In the fuel cell of such this invention, in order to introduce liquid fuel in a cel by capillary force, mechanical components, such as a pump for fuel supply, are not needed. Since the liquid fuel introduced in the cell is evaporated in a fuel evaporation layer using the heat of reaction of a cell reaction, it does not need accessory vessels, such as a fuel carburetor. Moreover, since the gaseous fuel in a fuel evaporation layer is mostly maintained at a saturation state, liquid fuel evaporates from a fuel osmosis layer a consumed part of the gaseous fuel in the fuel evaporation layer by the cell reaction, and liquid fuel is further introduced by capillary force in a cel an evaporated part.

[0016] Furthermore, since the fuel amount of supply is being interlocked with fuel consumption, in the fuel cell of this invention, it is unreacted, and there is no fuel discharged besides a cell and it hardly needs the processor of a fuel outlet side like the conventional liquid fuel cell. That is, since especially the fuel cell of this invention can supply liquid fuel smoothly, without using accessory vessels, such as a pump, a blower and a fuel carburetor, and a condenser, it becomes possible [attaining a

miniaturization].
[0017] In order to be stabilized and to supply liquid fuel to said fuel evaporation layer, the device in which the pressure of the interior can be adjusted is prepared in the liquid fuel hold container 1 for fuel cells of this invention. In order to be stabilized and to supply liquid fuel to a fuel evaporation layer, the device in which liquid fuel flows out of the liquid fuel hold container 1 duly according to the consumption in an evaporation layer is required. For example, it is the negative pressure cure device in which atmospheric air etc. is incorporated from the container exterior with the outflow of the liquid fuel from a hold container. It is controllable by this so that the interior of a container does not become negative pressure from a body side. As shown in drawing 1 , more specifically, it can consider as a negative pressure cure device by forming pore 6 in the predetermined field of the up side face of the hold container 1. Two or more pores 6 may be formed not only one but if needed. Moreover, although especially the magnitude of pore is not limited, when it takes into consideration preventing superfluous evaporation of liquid fuel, it is desirable to be referred to as about 0.2-5mm.
[0018] The removable film may be prepared in such pore 6. Moreover, as shown in drawing 3 , a cover 9 can also be formed in pore 6. When a user removes the film or cover 9 if needed, pore 6 can be exposed and atmospheric air can be introduced in a container 1.
[0019] Or the film of permselectivity can also be prepared in pore 6. The permeability of the evaporation object of a liquid fuel component of the film of permselectivity here is low, and, on the other hand, what has the comparatively high permeability of gases, such as atmospheric air, is used preferably. As film of permselectivity, a fluorine system FEP resin etc. is mentioned, for example. Although the thickness of the film of permselectivity can be suitably chosen according to the class of liquid fuel to be used, a component, maximum vapor tension, etc., it is usually about 10-1000 microns.
[0020] Moreover, in this invention, the cure against negative pressure can also be aimed at by introducing positively into the liquid fuel hold container 1 side the gas constituents generated in the body 2 side of a fuel cell. For example, as shown in drawing 4 , it can arrange in a container 1 combining the liquid fuel osmosis material 8 for supplying liquid fuel, and the gas installation capillary 11 for drawing the gas which occurred in the body side in a fuel hold container. The gas installation capillary 11 may be arranged over the longitudinal direction inside the liquid fuel osmosis material 8. That is, the fuel osmosis member 8 for transmitting liquid fuel can be formed outside, and it can consider as the dual structure which has arranged the gas installation capillary 11 for leading the gas which occurred in the body 2 side to the fuel hold container 1 to the inside. However, it is not limited to such structure but can prepare in a container 1 combining the liquid fuel osmosis material 8 for supplying liquid fuel, and the gas installation capillary 11 for drawing the gas which occurred in the body side in a fuel hold container by the technique of arbitration.
[0021] The condition that the liquid fuel hold container 1 was connected to the introductory tubing 3 at drawing 4 (a) is shown, and the liquid fuel osmosis material 8 and the gas installation capillary 11 have reached the body 2 (not shown). When not connecting a container 1 to the introductory tubing 3, volatilization of the liquid fuel 7 held in the container 1 can be prevented by covering with a cover 10, as shown in drawing 4 R> 4 (b).
[0022] In addition, when the pressure of the gas part in the liquid fuel hold container 1 rises remarkably with the temperature etc., there is a possibility that liquid fuel may be superfluously supplied to a body 2 side from a liquid fuel hold container with a pressure buildup. Furthermore, the pressure inside a liquid fuel hold container rises, and the fault that risk arises occurs. In order to prevent such fault, when the pressure in a container becomes beyond a predetermined value, it is desirable to establish the device which misses the pressure. For example, as shown in drawing 5 , it is possible to form the movable pressure release valve 15 in some liquid fuel hold containers 1 according to an operation with a spring 14 and O ring 13. Or it is also technique effective in disconnection of a pressure to prepare the protection film which explodes above a fixed pressure.
[0023] The pressure in a container can be adjusted by establishing a negative pressure cure device or a pressurization cure device which was mentioned above.
[0024] Furthermore, in the power source for small devices, even when the body of a fuel cell has been

arranged in what kind of direction, it is called for that it is stabilized and a fuel is supplied. In using the fuel of a liquid condition especially, if the device is not made by the introductory approach, there is a possibility that supply of a fuel may stop. In the fuel cell of this invention, even when a body is installed in what kind of direction, liquid fuel is wanted to flow out of the liquid fuel hold container connected to this duly.

[0025] As shown in drawing 6 , specifically, the structure which arranges inside a container the member (liquid fuel osmosis material) 8 which is easy to permeate liquid fuel is mentioned so that it may reach to the fuel derivation section 12. In the container shown in drawing 6 (a), the liquid fuel osmosis material 8 is formed in the near field in which the fuel derivation section 12 in a container is formed, and the field which counters this field, and also in which field, the liquid fuel osmosis material 8 is arranged so that each field may be covered. The liquid fuel osmosis material 8 prepared in two fields is connected by the same liquid fuel osmosis material 8. By forming the liquid fuel osmosis material 8 in a container 1 by such arrangement, a part of liquid fuel osmosis material [at least] 8 will always touch liquid fuel 7. Therefore, no matter the hold container 1 may be installed in what vertical direction, liquid fuel 7 can be supplied to the liquid derivation section 12.

[0026] Moreover, in the container shown in drawing 6 (b), the liquid fuel osmosis material 8 is formed in two fields where it counters of the walls of a container. Like the case of drawing 6 (a), also in which field, the liquid fuel osmosis material 8 is arranged so that each field may be covered. Such two liquid fuel osmosis material 8 touches the pore 6 for atmospheric-air introduction or the fuel derivation section 12 formed in the container outer wall, respectively. Since a part of two liquid combustion osmosis material [at least] 8 will always touch liquid fuel 7, even if it is the case where the hold container 1 has been arranged in what kind of vertical direction, it becomes possible [supplying liquid fuel 7 to the fuel derivation section 12]. In addition, when the upper and lower sides of the hold container 1 shown in drawing 6 (b) have been arranged on the contrary, the pore 6 and the fuel derivation section 12 for atmospheric-air incorporation interchange and act.

[0027] Moreover, the liquid fuel in a hold container can also consider as the structure always extruded by the pressure device to the liquid derivation section. The example of the container of such structure is shown in drawing 7 . In the container shown in drawing 7 (a), the fuel enclosure member 30 moves with a spring 14. Liquid fuel 7 is extruded from the fuel derivation opening 12 by it. Moreover, in the container shown in drawing 7 (b), liquid fuel 7 is held in the spring-like liquid-storage section 16, and is extruded by operation of this liquid-storage section itself from the fuel derivation opening 12.

[0028] In addition, not only the mechanical pressure of a spring etc. but the enclosed gas pressure may be used as stress which extrudes liquid fuel. As gas to be used, especially although inert gas, such as an argon and nitrogen, is desirable, it is not limited.

[0029] Furthermore, as shown in drawing 8 (a) - drawing 8 (c), the device in which only the liquid hold container itself or the liquid-storage section in which liquid fuel is held at least is rotated can also be established.

[0030] In the container 1 shown in drawing 8 (a), since the introductory tubing 3 which derives liquid fuel consists of flexible members, a container 1 can be installed irrespective of the installation sense of the body of a fuel cell (not shown) so that the liquid derivation section 12 may serve as a lower part.

[0031] The container 1 shown in drawing 8 (b) is spherical, and is supported in the housing 17. The dead weight 19 is formed in the predetermined part in a container 1, and bearing 18 is arranged between the housing 17 and the container 1. No matter the body of a fuel cell (not shown) may be arranged in what direction by considering as such a configuration, the liquid-storage section can be rotated to 360-degree freedom, and the fuel derivation section 12 can be located under the liquid-storage section.

[0032] Moreover, since, as for the container shown in drawing 8 (c), the operation of weight 19 is established, the liquid derivation section 12 is surely located under the liquid-storage section. And since the liquid fuel osmosis material 8 reaches the liquid derivation section 12 and is prepared in the container 1, as long as liquid fuel is in contact with this liquid fuel osmosis material 8, it becomes possible to supply liquid fuel 7 to a body (not shown).

[0033] Thus, by not depending in the installation direction of the body of a fuel cell, but being

stabilized, and using the liquid fuel hold container which can supply liquid fuel, the fuel cell of an operating environment making it restrain of this invention was lost, and became possible [applying to the large range].

[0034] Furthermore, consideration of that the fuel used is a liquid wants the connection of a liquid fuel hold container and a body to be the structure supplied by not revealing a fuel but being stabilized, in case liquid fuel is supplied to a body from a liquid fuel hold container. When the vapor pressure of a fuel is comparatively high, as for especially a removable liquid fuel hold container, it is desirable that it is the structure where a fuel does not vaporize in a state of preservation.

[0035] The example of the container of such structure is shown in drawing 9 . The condition of having connected the container 1 to the introductory tubing 3 is expressed to drawing 9 (a), and the member (liquid fuel osmosis material) 8 which a fuel tends to permeate is formed to the liquid fuel derivation section in the liquid fuel hold container 1. Furthermore, the same fuel osmosis material 8 is arranged also to the introductory tubing 3 interior. Liquid fuel 7 is supplied to the receiver 5 of the body of a fuel cell through the fuel osmosis material 8 in the introductory tubing 3.

[0036] Before connecting the container 1 of such structure to the introductory tubing 3, the derivation section can be covered with the cover 10 as shown in drawing 4 (b), and volatilization of the liquid fuel held in the container can be prevented. Or volatilization of liquid fuel may be prevented by forming a closing motion cover in the derivation section of a container 1. As shown in drawing 9 (a), in case a container is connected to introductory tubing, removing the cover of the container prepared in the derivation section, or by opening the closing motion cover of the derivation section, the fuel osmosis material 8 is exposed and it connects with the introductory tubing 3.

[0037] An example of the structure of the connection 4 in drawing 9 (a) is shown in drawing 9 (b). The tubed cover 31 for tap hole closing motion is formed in the perimeter of the derivation section 12 of the hold container 1 possible [sliding], and the osmosis material connection pad 32 is formed in the wall of the introductory tubing 3. In case such a hold container 1 is connected to the introductory tubing 3, the cover 31 for tap hole closing motion is pushed up, and the derivation section 12 of a container 1 and the osmosis material connection pad 32 of the introductory tubing 3 contact. Thus, if the derivation section 12 and the osmosis material connection pad 32 contact, liquid fuel will be introduced by capillarity from a container 1 side to the introductory tubing 3 side.

[0038] Moreover, only when the liquid fuel hold container 1 is connected to a body, it can also consider as the container of the structure where liquid fuel 7 flows out. The example of the connection of such a container and introductory tubing is shown in drawing 10 - drawing 12 .

[0039] In the example shown in drawing 10 (a), the connection 33 and the medial axis 20 with a taper which can slide are prepared in the derivation section of a container 1. In addition, the top view of this outflow section is expressed to drawing 10 (b). The projection 21 is formed, and when a container 1 is inserted into the introductory tubing 3, a connection 33 is made the wall of the introductory tubing 3 upwards by this projection 21. Since the taper is formed toward the upper part, the pore at the tip of a connection 33 is wide opened as a connection 33 is raised, and, as for the medial axis 20 with a taper, liquid fuel 7 flows out of the hold container 1 into the introductory tubing 3.

[0040] The connection shown in drawing 10 (a) can also be changed as shown in drawing 11 (a). In drawing 11 (a), when a container 1 is inserted in the introductory tubing 3, the boss 22 for pushing up the connection 33 of a container is formed in the interior of introductory tubing. Structures other than this are the same as that of what was shown in drawing 10 (a). In addition, the outflow section of a container 1 and the top view of the introductory tubing 3 are shown in drawing 11 (b) and drawing 11 (c), respectively. Also in the example shown in drawing 11 (a), since the taper is formed toward the upper part, the pore at the tip of a connection 33 is wide opened as a connection 33 is raised, and, as for the medial axis 20 with a taper, liquid fuel 7 flows out of the hold container 1 into the introductory tubing 3.

[0041] Furthermore, a connection as shown in drawing 12 is also possible. In the example shown in drawing 12 , the valve element 23 for fuel outflow control is attached in the outflow section of a container 1 with the spring 14. On the other hand, in the introductory tubing 3, when a container 1 is

connected, the boss 22 for pushing up this valve element is formed. Therefore, when a container 1 is connected to the introductory tubing 3, the valve element 23 prepared in the container is pushed up by the boss 22, an outflow hole is opened wide, and liquid fuel 7 is supplied to the introductory tubing 3.
[0042] By adopting such technique, the device which is compatible in the shelf life of liquid fuel and adequate supply of the fuel at the time of connection can be prepared in the connection of a hold container. When such a liquid fuel hold container is connected to the body of a fuel cell, a reliable fuel cell is obtained. In addition, O ring 13 for sealing liquid fuel in drawing 12 from drawing 9 (a) may be formed in the connection or body side.
[0043] The liquid fuel hold container of this invention can also be arranged in the upper part of a body, as shown in drawing 13 . That is, it is the structure where the container 1 and the body 2 of a fuel cell were connected so that it may become the direction where the principal plane of the electrolyte plate which constitutes the cell of the body of a fuel cell, and the oil level of the liquid fuel held into the container cross at right angles. When supplying liquid fuel to the body 2 of a fuel cell using gravity, it is desirable to install the liquid hold container 1 in the upper part of a body in this way. When installing a liquid hold container in the upper part of a body so that it may illustrate, a container 1 and a body 2 can be connected so that liquid fuel may be directly introduced into the receiver 5 of a body.
[0044] Moreover, as shown in drawing 14 (a) and (b), it is also possible to carry out direct continuation of the liquid fuel hold container to the side face of a body. In this case, it can be said that the container and the body are connected so that the oil level of the liquid fuel held into the container may serve as a direction parallel to the principal plane of the electrolyte plate which constitutes the cell of the body of a fuel cell. Although not illustrated, a liquid fuel hold container may be installed in the lower part of a body. When installing a liquid fuel hold container in the side face and the lower part of a body, liquid fuel can be supplied to a body side using capillary force etc.
[0045] in order to operate the fuel cell of this invention for a long time -- the liquid fuel hold container 1 -- attachment and detachment -- although connecting exchangeable is desirable, it can also fix and use for the introductory tubing 3 or a body 2 after connection. When the hold container 1 is being fixed to the introductory tubing 3 or a body 2, as shown in drawing 15 , it is desirable to form the pore 27 for a liquid fuel supplement in a predetermined location. It becomes possible to supply liquid fuel from this pore 27 by this, using the liquid fuel supply instrument 24 so that it may illustrate.
[0046] attachment and detachment -- exchanging containers in the case of an exchangeable container -- moreover, by filling up a fuel in the case of the container which can be supplemented with liquid fuel, in spite of being small, it becomes possible to carry out long duration actuation of the fuel cell.
[0047] However, to be able to check the amount of survival of the fuel in a container by looking from the exterior is desired so that a removable liquid fuel hold container can check an exchange stage. It is desirable similarly, to also make the liquid fuel hold container of the structure where liquid fuel can be filled up into the structure which can check the amount of survival of the fuel in a container by looking from the exterior so that the supplement stage of a fuel can be checked.
[0048] For example, as shown in drawing 16 (a) and (b), liquid hold container 1 the very thing can be constituted from transparence or a translucent ingredient, and the amount of survival of the liquid fuel held in the interior can be checked. As transparence or a translucent ingredient, fluororesin, such as polyethylene, polypropylene, a polycarbonate, and Teflon, etc. can be used, for example. Or as shown in drawing 17 , it is also possible by forming the aperture 25 for the amount check of liquid fuel survival in the predetermined part of a container 1 to check the amount of the liquid fuel which remains inside.
[0049] Furthermore, in order to make easy the amount check of liquid fuel survival in a container, devising to a fuel side is also desirable. It is supply of liquid fuel or evaporation, and the matter that does not become the hindrance of a reaction, and, specifically, it is possible to color a fuel. As such matter, organic, an inorganic system color, etc. are mentioned, for example. Or you may add to liquid fuel by making a solid-state with specific gravity lighter than liquid fuel like styrene foam into float material. Since such float material 26 is always located in the oil level of liquid fuel as shown in drawing 18 , it can check the amount of survival of liquid fuel more easily by combining with the container 1 as shown in drawing 16 and drawing 1717 . The matter added in order to detect an oil level is not limited to a

solid-state, and the colored organic solvent with specific gravity lighter than liquid fuel and a liquid like oil may be used for it.
[0050] As mentioned above, by using the liquid fuel hold container for fuel cells of this invention, a stable output is secured and a reliable fuel cell is obtained. Furthermore, even if the direction of installation of the body of a fuel cell used is not restricted at all but arranges a body in the direction of arbitration, it is stabilized and can supply liquid fuel. For this reason, it becomes possible to extend the applicability of a fuel cell greatly.
[0051]
[Embodiment of the Invention] Although an example is shown and this invention is hereafter explained further to a detail, this invention is not limited to these.
[0052] (Example 1) The cell inside the body of a fuel cell was first produced by the following technique.

[0053] The 32mmx32mm fuel electrode which applied the Pt-Ru system catalyst bed on the carbon cross, and the 32mmx32mm oxidizer pole which applied Pt black catalyst bed on the carbon cross were prepared. The electrolyte membrane which consists of perfluoro sulfonic-acid film was pinched so that the catalyst bed of such a fuel electrode and an oxidizer pole might touch an electrolyte membrane. The hotpress of these was carried out for 5 minutes and by the pressure of 100kg/cm2 by 120 degrees C, it joined, and the electromotive section was produced.
[0054] The obtained electromotive section and the carbon porosity plate as a fuel evaporation layer (85 micrometers of average apertures, 73% of porosity), The laminating of the carbon porosity plate (5 micrometers of average apertures, 40% of porosity) as a fuel osmosis layer was carried out, it has arranged between the oxidizer pole side electrode holder which prepared the oxidant gas supply slot (a depth of 2mm, width of face of 1mm), and a fuel electrode side electrode holder, and the cell of 2 was produced a reaction area of 10cm. The ten-piece laminating of the cell of such a configuration was carried out, and the body of a fuel cell was acquired.
[0055] On the other hand, 350ml of 1:1 (mole ratio) mixed liquor of a methanol and water was held in the liquid fuel hold container as liquid fuel. The pore 6 with a diameter of about 5mm was formed in the location as shown in this container at drawing 1 , the film (the product made of a fluorine system FEP resin, 25-micron thickness) of permselectivity has been arranged, and the negative pressure cure device was established.
[0056] Such a liquid fuel hold container for fuel cells was set to the connection of the above-mentioned liquid fuel cell proper as shown in drawing 1 . Under the present circumstances, the connection of structure as shown in drawing 9 was used for connection between the liquid fuel hold container 1 and the introductory tubing 3. Therefore, the liquid fuel 7 in the liquid fuel hold container 1 is supplied to a fuel electrode side by capillary force through the introductory tubing 3, a receiver 5, and the above-mentioned carbon porosity plate.
[0057] Using the fuel cell of such structure, the air of 1atm was passed to the gas channel by 100 ml/min as oxidizing agent gas, and it generated electricity at 80 degrees C.
[0058] Consequently, the output of electrical-potential-difference 5.1V and current 280 mA/cm2 could be taken out, and also when it continued for 18 hours and this generation of electrical energy was performed, the output did not decline and was stable. Moreover, since exsorption of a fuel (methanol: water mixed solution) did not take place at all not only at the time of fuel cell operation but at the time of attachment and detachment of a fuel container, it was checked that it is a reliable small fuel cell.
[0059] (Example of a comparison) The fuel cell was constituted like the above-mentioned example 1 except having used the liquid fuel hold container which does not prepare the pore of the cure against negative pressure. Each of the configuration of the body of a fuel cell, continuation of a body and a hold container, methods of supplying a fuel, and used fuels is the same as that of the case of an example 1.
[0060] In this fuel cell, as oxidizing agent gas, air of 1atm was performed by 100 ml/min, and the generation-of-electrical-energy trial was performed to the gas channel at 80 degrees C like the sink and the above-mentioned example 1 on the oxidization pole.
[0061] Consequently, although electrical-potential-difference 4.8V and current density 300 mA/cm2

were able to be taken out at the beginning of generation-of-electrical-energy initiation, the output declined with the passage of time. The output which was able to be taken out after operation of 8 hours is 2 electrical-potential-difference 3.1V and the current density of 120mA/cm, and is remarkably lower than an example 1.

[0062] Thus, it was checked that the fuel cell of the example of a comparison using the liquid fuel hold container which does not establish a negative pressure cure device is unreliable.

[0063] (Example 2) The body of a fuel cell was produced like the above-mentioned example 1, and the receiver section was prepared with the organic material which is easy to permeate a methanol as a receiver 5.

[0064] What can carry out direct continuation was prepared for the upper part of the body 2 of a fuel cell as shown in drawing 1313 as a liquid fuel hold container for fuel cells, two pores for the cure against negative pressure were prepared, and it covered with a cap. The location of two pores established in the hold container is made into the location of the vertical angle of a container, and enabled it to adopt the open air at least from one side. Furthermore, it made it possible to arrange the liquid fuel osmosis ingredient 8, as shown in drawing 13 , not to depend in the installation direction of a body, but to supply liquid fuel in a hold container. The container of such a configuration was set to the body 2 of a fuel cell as shown in drawing 13 . Under the present circumstances, the connection of structure as shown in drawing 9 (a) was used for connection between the liquid fuel hold container 1 and a cell proper 2.

[0065] Holding 200ml of equimolar mixed solutions of a methanol and water as a fuel in the liquid fuel hold container, the liquid fuel 7 in the liquid fuel hold container 1 supplied liquid fuel 7 to the fuel electrode side according to capillary force through the osmosis ingredient 8, the receiver 5, and the above-mentioned carbon porosity plate. The cap 9 of the pore for a negative pressure cure of the container upper part was opened at that time.

[0066] Using the fuel cell of such structure, the air of 1atm was passed to the gas channel by 100 ml/min as oxidizing agent gas, and it generated electricity at 74 degrees C.

[0067] Consequently, the output of electrical-potential-difference 4.6V and current 240 mA/cm2 could be taken out, and also when it continued for 8 hours and this generation of electrical energy was performed, the output did not decline and was stable.

[0068] Furthermore, the pore 6 for a negative pressure cure of the hold container 1 was temporarily closed during the generation of electrical energy of a fuel cell, the upper and lower sides were reversed calmly, and arrangement was changed so that a body 2 might serve as the upper part of the liquid fuel hold container 1. Then, when pore 6' for a negative pressure cure of another side was opened wide and having been generated electricity succeedingly, the big change even after 3-hour progress to an output was not seen. This shows that the fuel cell of this invention is not concerned with the arrangement, but a generation of electrical energy is possible. Moreover, since exsorption of a fuel (methanol: water mixed solution) did not take place at all not only at the time of fuel cell operation but at the time of attachment and detachment of a fuel container, it was checked that it is a reliable small fuel cell.

[0069] (Example 3) The body of a fuel cell was produced like the above-mentioned example 1.

[0070] The thing of the type which can perform supply as shown in drawing 1515 as a liquid fuel hold container for fuel cells was prepared. Moreover, the polycarbonate constituted this container. Since the ingredient used for the container is translucent, as drawing 16 was explained, the condition of the liquid fuel held in the interior can be checked by viewing.

[0071] As a fuel, 1:1 mixed solutions were prepared by the mole ratio of a methanol and water, and it colored with the organic system color as coloring matter. Furthermore, two or more balls made from styrene foam whose diameters which were explained about drawing 18 are about 5mm were added to this liquid fuel. In this way, 50ml of obtained fuels was held in the above-mentioned liquid fuel hold container, and it connected with the body of a fuel cell. Under the present circumstances, the connection of structure as shown in drawing 9 (b) was used for connection between the liquid fuel hold container 1 and the introductory tubing 3. Therefore, the liquid fuel 7 in the liquid fuel hold container 1 is supplied to a fuel electrode side by capillary force through the osmosis ingredient 8, a receiver 5, and the above-mentioned carbon porosity plate.

[0072] Using the fuel cell of such structure, as a condition which removed the cap 9 of negative pressure [refueling-cum-] cure pore, the air of 1atm as oxidizing agent gas was started by 80 ml/min, and the generation-of-electrical-energy trial was started at a sink and the temperature of 75 degrees C to the gas channel.
[0073] Consequently, the output of electrical-potential-difference 4.5V and current density 260 mA/cm2 could be taken out, and the big change even after operation of 4 hours to an output was not accepted. Since consumption of liquid fuel was checked by viewing from the exterior at this time, the 50 moreml fuel was anew added in the container using the refueling instrument, and the generation-of-electrical-energy trial was continued. During operation of 4 more hours, the big change to an output was not accepted and faults, such as leakage of liquid fuel, did not happen at all, either. For this reason, functioning as a reliable fuel cell was checked.
[0074] (Example 4) The body of a fuel cell was produced like the above-mentioned example 1.
[0075] What was equipped with the negative pressure cure device as shown in drawing 3 R> 3 as a liquid fuel hold container for fuel cells was prepared, and 200ml of equimolar mixed solutions of the methanol as a fuel and water was held into this.
[0076] This fuel hold container was connected with the body of a fuel cell, and the fuel cell as shown in drawing 1 was produced.
[0077] In addition, as shown in drawing 3 , the capillary 11 which can introduce the gas which occurred in the body side was formed in the interior of the liquid absorber 8 in the liquid fuel hold container 1 and the introductory tubing 3. One edge of this capillary 11 is opened in the liquid fuel hold container 1, and the other-end section is opened to the tooth space which collects COs2 generated in the anode side by the side of a body 2. Furthermore, above the constant pressure, it made it possible to open CO2 wide from this valve by preparing the valve for pressure regulation in the middle of a capillary 11.
[0078] Using the fuel cell of such structure, the air of 1atm was passed to the gas channel by 100 ml/min as oxidizing agent gas at the cathode side, and the generation-of-electrical-energy trial was started at the temperature of 65 degrees C.
[0079] Consequently, the output of electrical-potential-difference 5.1V and current density 270 mA/cm2 was able to be taken out. The big change to an output was not accepted after operation of 10 hours, but liquid fuel was stabilized the neither more nor less, it was supplied, and it was checked that the generation of electrical energy is performed.
[0080] Moreover, although the phenomenon in which originated in CO2 generating and the pressure inside a body became high temporarily was accepted, since the pressure open valve prepared in the capillary opened, internal pressure did not become high any more. There are also no faults, such as leakage of liquid fuel, and functioning as a reliable fuel cell was checked.
[0081] (Example 5) The body of a fuel cell was produced like the above-mentioned example 1.
[0082] What, on the other hand, has the pivotable liquid-storage section as shown in drawing 8 (b) as a liquid fuel hold container 1 was prepared. Pore with a diameter of about 3mm was formed in this container, the Teflon system FEP film (30-micron thickness) which has permselectivity has been arranged in it, and the negative pressure cure device was prepared in it. In this fuel hold container, 150ml of equimolar mixed solutions of a methanol and water was held as liquid fuel, it connected with the fuel cell book etc. with flexible introductory tubing, and the fuel cell was obtained. In addition, liquid fuel osmosis material is arranged inside introductory tubing used here.
[0083] Liquid fuel was supplied to the fuel cell of such a configuration according to capillarity at the anode side, the air of 1atm was passed to the gas channel by 90 ml/min as oxidizing agent gas at the cathode side, and the generation-of-electrical-energy trial was started at the temperature of 80 degrees C.

[0084] Consequently, the output of electrical-potential-difference 4.8V and current density 300 mA/cm2 could be taken out, and the output was stable also when a generation of electrical energy of about 6 hours was performed. Moreover, it was in the middle of operation, and when about 15 degrees of bodies were leaned and the generation-of-electrical-energy trial was continued, it was able to generate electricity by the fuel supply to a body not being overdue and being stabilized.

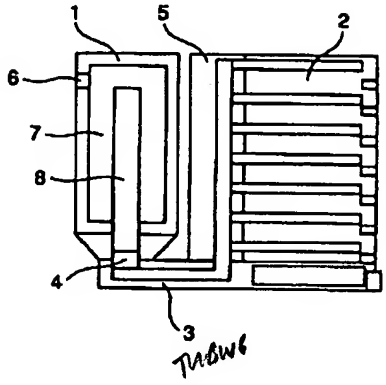
[0085]
[Effect of the Invention] As explained in full detail above, while simplifying the distribution system of liquid fuel according to this invention, it is stabilized, liquid fuel can be supplied and a fuel cell with the high dependability by which the output was stabilized is offered.
[0086] Without using a pump, Blois, etc. by using the liquid fuel hold container for fuel cells of this invention, evaporation supply of the liquid fuel can be smoothly carried out with simple structure, and it is stabilized, and a high output can be obtained. Moreover, since the liquid fuel hold container was equipped with the pressure-regulator style, even if it became possible to be stabilized in the fuel evaporation section and to supply liquid fuel and having been generated electricity continuously, the fuel cell with high dependability with little output fluctuation was obtained.
[0087] And irrespective of the installation sense of a body, the structure which continues from a liquid fuel hold container and supplies a fuel is also acquired, and the service space of a fuel cell and the degree of freedom of the mounting arrangement can be improved greatly. Furthermore, since it was automatically generated by attachment and detachment of a liquid fuel hold container, while an outflow and a halt of the liquid fuel from a liquid fuel hold container had simple control, it became possible [controlling unnecessary outflow and vaporization of a fuel].
[0088] Thus, it became possible by this invention that it is compatible in high performance and the simplification of a system for the first time. A fuel cell with the high dependability which it not only can supply liquid fuel, but is stabilized during operation and liquid fuel does not leak by this invention while planning small [which was made conventionally difficult] is obtained, and the industrial value is greatest.

[Translation done.]

２５…液体燃料残量確認窓
２６…浮き材
２７…液体燃料補充用細孔
３０…液体封入部材
３１…流出口開閉用ふた
３２…浸透材接続パッド
３３…接続部

a…気化板
b…アノード
c…電解質膜
d…カソード
e…ガスチャネル
f…セパレータ
g…液体浸透板

【図１】



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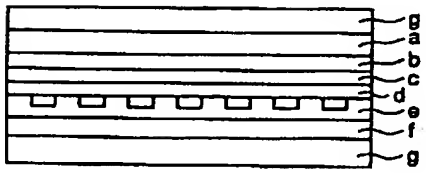

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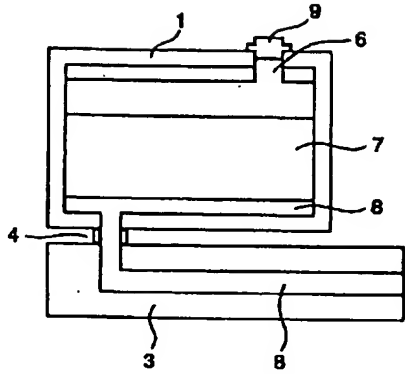

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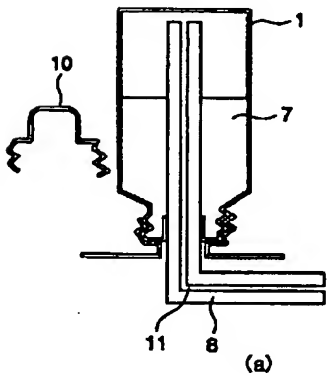

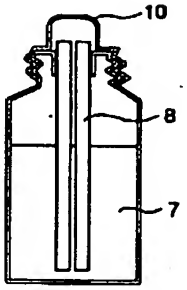

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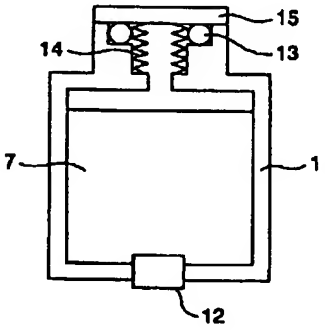

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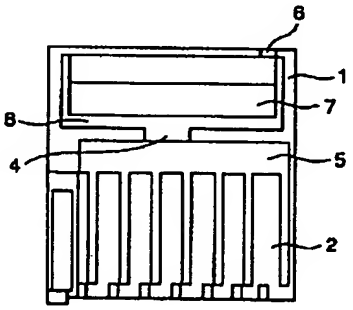

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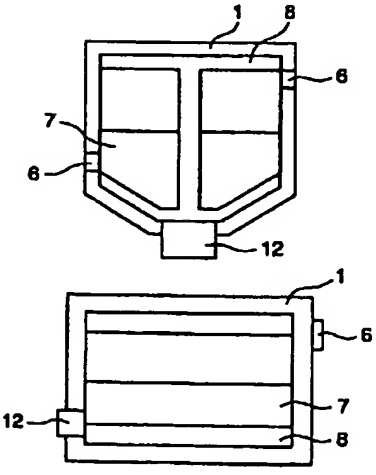

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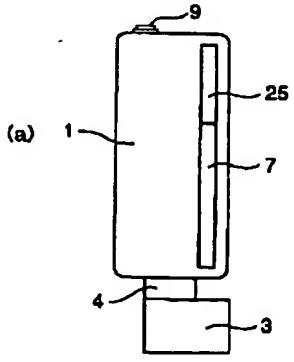

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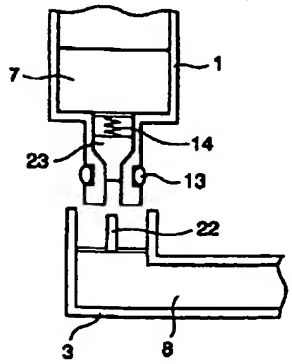

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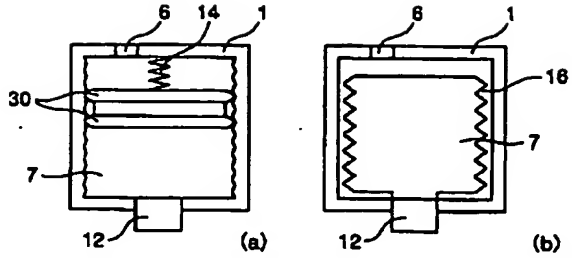

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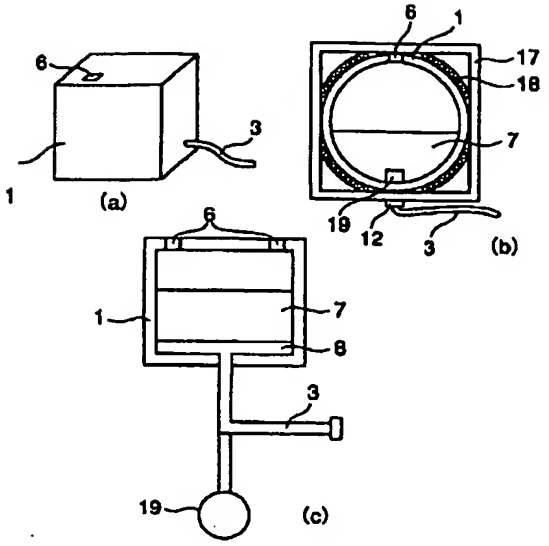

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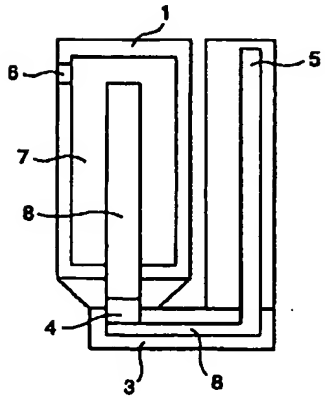

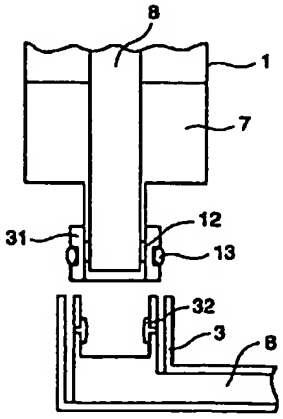

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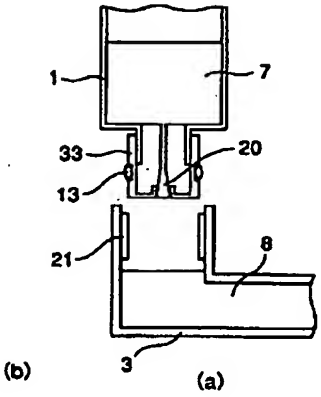

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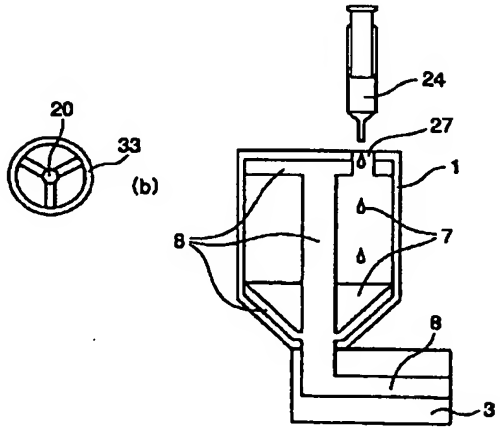

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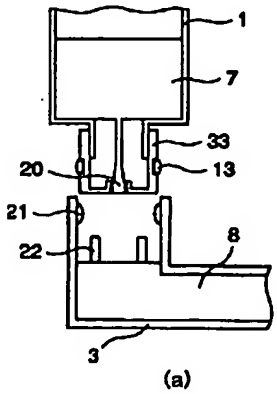

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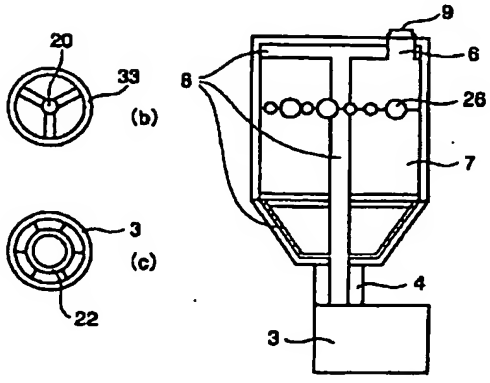

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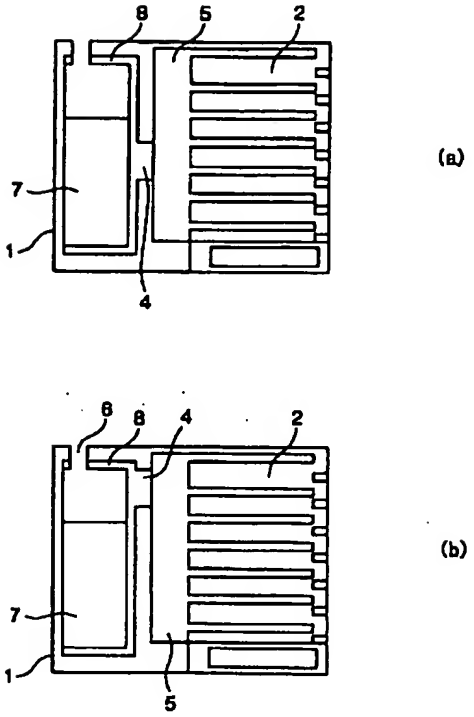

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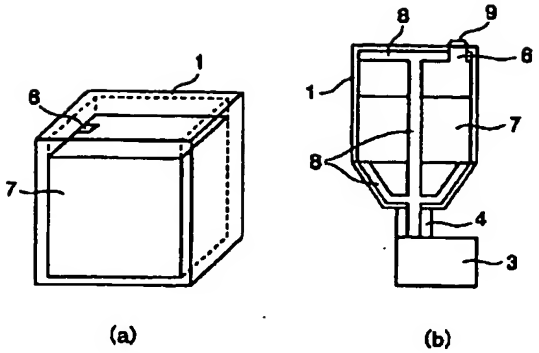

フロントページの続き

(72)発明者　角野　裕康
神奈川県川崎市幸区小向東芝町１番地　株式会社東芝研究開発センター内

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